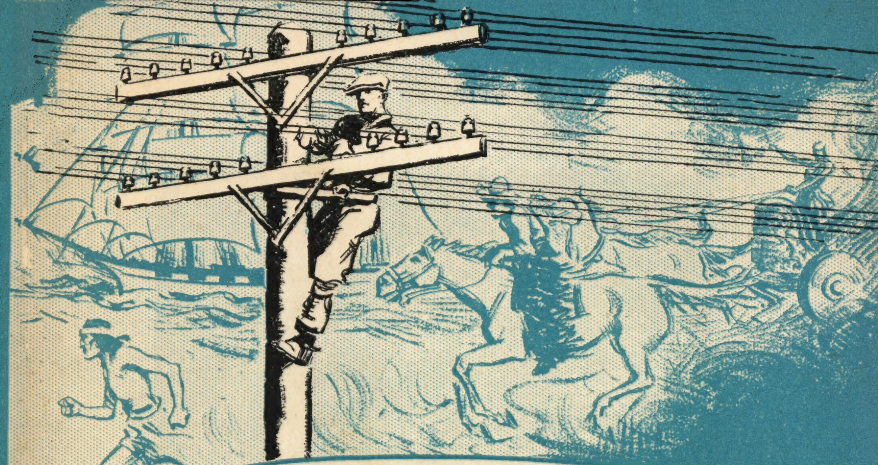
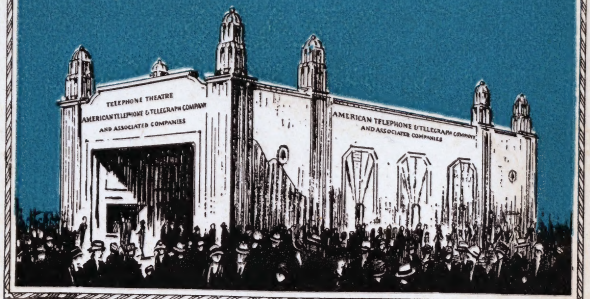


50 YEARS OF PROGRESS

as told by your Telephone

Printed for
Visitors to the Exhibit
of the
BELL TELEPHONE SYSTEM
at the
Sesquicentennial
International Exposition
Philadelphia, Pa.



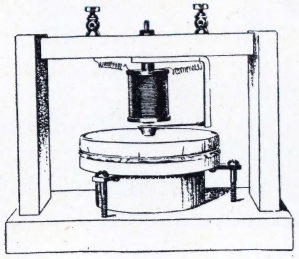
YOU CALL ME THE TELEPHONE

By that you may mean that I am the black instrument which stands on your office desk—a thing of iron, of copper, of mica and of rubber; a mechanical contrivance

which is, it is to be granted, one of the most useful of the tools with which the work of everyday life is done, but still a piece of machinery.

Or you may mean that I am something more than this. You may think of me as a personality, reflecting the aims, the ambitions and the pride of achievement of the hundreds of thousands of men and women who have helped me to become what I am. You may think of me as the symbol of a nation-wide service. You may think of me as having wrapped up within me the romance and the tradition of the fifty years during which this nation-wide service has been in the making.

I am not simply a thing. I am also a thought.



Instrument through which speech sounds were first transmitted electrically, 1875

As a mechanical device, the telephone is not today what it was fifty years ago. As an ideal—as a conception of an opportunity for service—the telephone is in 1926 essentially what it was in 1876, though this ideal has undergone a half-century of evolution which has given it an ever-widening horizon.

Loading coils

It is, therefore, of the telephone-*thought*, rather than the telephone-*thing*, that I ask you to think as I tell you of the early days of my remarkable half-century of life.

At first I was only a thought. For some years I was merely an idea, vaguely formed in the mind of Alexander Graham Bell. Then, on June 2, 1875, I took definite form when Bell found the means of producing the undulatory current which he believed was essential to the electrical transmission of speech. That day I was born. That day Bell instructed his young assistant, Thomas A. Watson, to make an instrument which would embody the principle he had discovered. When Watson returned, the next day, with the apparatus completed, the eldest of my brothers—

the first telephone instrument—was also born.

For you may think of me, the telephone-*thought*, as being the first-born of all of the great family of telephone-*things*—transmitters and receivers, switchboards, poles, cables, repeater-station apparatus and other pieces of equipment almost without number—that have been created during the last half-century. Of all of these Bell was the father, and I, the thought behind the telephone, was the elder brother. Bell soon retired from active participation in the development of his invention, but I remained, to inspire the minds of others.

The first telephone was born speechless, like every other infant. Other telephones followed in the months between June, 1875, and March, 1876. Some of them could utter strange, unintelligible sounds, some could feebly lisp a word or two, but none could really speak. All of them, however, were advances in the development of the telephone thought; all of them were steps in the evolution of Bell's idea. I was beginning to grow.

Finally, on March 10, 1876, a telephone, somewhat different in form from those which had preceded it, first spoke a complete sentence. This sentence was spoken by Dr. Bell to his young assistant. It was: "*Mr. Watson, come here, I want you.*"

"*Mr. Watson, come here, I want you.*"

With the speaking of that first telephone sentence, I became something more than an idea—I grew into an ideal. The moment Bell had proved to his own satisfaction that his

Boy switchboard operators, New York, 1879

invention was practical, he began to dream of it as an instrumentality of service. He saw homes linked with offices; physicians put into touch with their patients; the isolation of farms swept aside; cities bound together with the bonds of speech. The telephone was still hardly more than a thought—but a thought with vastly expanded horizons.

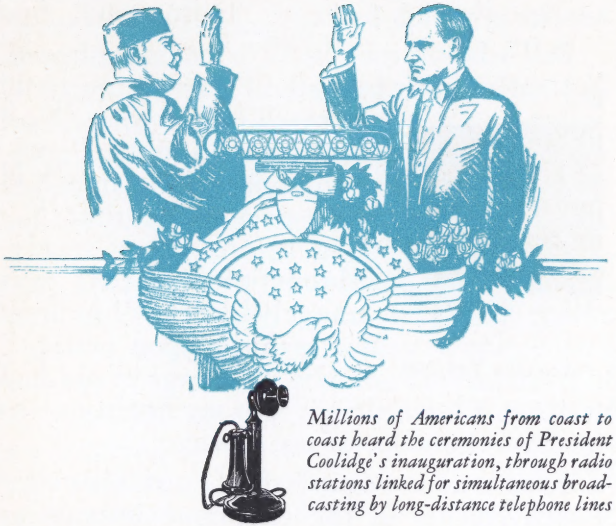
This idea and this ideal were Bell's great contributions to the art of communications and to the world. It was one thing for him to dream of this future of service for the children whom he had brought into being, and quite another thing to transform these dreams into realities. In order that this vision might be fulfilled, the telephone as an ideal and the telephone as a mechanical device had to be merged. The telephone-*thing* and the telephone-*thought* had to become one.

Mine is not simply the story of an instrument. It is the story of an inspiration as well —of the growth of the instrumentality of nation-wide service of which you now think when you speak of The Telephone.

To say that the early years of telephone history were the years of my childhood is to do much more than to use a picturesque metaphor. The problems which Bell and his associates faced were literally those any parent faces. I was, it is true, no longer a speechless babe, but I was still a child. I had to be nourished, that I might grow in strength. I had to be trained, that I might perform my task aright. I had to be taught to speak more clearly, and with greater power, than I had spoken on that March day when I uttered my first sentence.

There was, first of all, the problem of obtaining capital, which is the food with which new inventions and new instrumentalities of public service must be nurtured. Bell, Watson and two Boston business men, Gardiner G. Hubbard and Thomas Sanders, were the four men who undertook the task of developing the telephone commercially. Most of the financing was done by the two men last named. Capital from outside sources was at first desperately difficult to obtain. Shrewd investors refused to take the telephone seriously. They could not be persuaded of the likelihood of its ever "growing up." And so there were days of the deepest discouragement for the four men who had undertaken the task of the telephone's upbringing—days when the child all but died of a financial malady that was very like starvation.

Even in these days, however, the *thought* that was later to become a nation-wide service persisted. The ideal remained, though progress in attaining it was slow. Physically, I was a weak child, but I had a spiritual quality, acquired from these men of faith who were the pioneers of telephone history, which helped me to carry on. I survived.

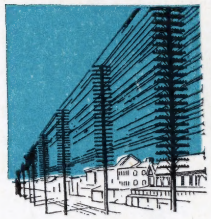


Millions of Americans from coast to coast heard the ceremonies of President Coolidge's inauguration, through radio stations linked for simultaneous broadcasting by long-distance telephone lines

But I had much to learn, in those early years when I was being fitted for my work in the world. On that March day when I first learned to speak, the Art of Telephony was represented by two telephones and a length of wire running from room to room, and my words could barely be heard over this short distance. Obviously I must be taught to strengthen my voice if I was to become the instrumentality of the widespread

service of which Bell and his fellows dreamed.

Bell's laboratory became my schoolroom. Patiently, little by little, I learned to extend the reach of my voice. New instruments appeared, each with some slight improvement over those that had gone before. In a steady, arduous process that was strangely like the "line upon line, precept upon precept" of which the sage of old had written, I learned to widen my horizons—to increase the scope of my service.



Poles in New York, 1887

This was accomplished, not alone by improvements in the telephone instrument itself, but in other apparatus and equipment that was necessary in order to enable it to carry man's voice to a distant point. Iron wires—single wires with a "ground return"—were replaced by a pair of wires of a special form of copper, hard-drawn to make it suitable for the purpose to which it was to be put. As time went on, other improvements were found, which increased the carrying power of the spoken word. Within two decades, telephone lines linked many of the larger cities of the East.

With further refinements in apparatus and transmission equipment, I began to provide a service for which "Long Distance" was more than a mere name. In 1892 the toll lines united New York and Chicago. For some years, this appeared to be the limit of the distance over which man's voice could travel by wire. The farther it travels, the telephone current becomes gradually weaker and weaker. The next step in the development of nation-wide service lay in the direction of overcoming this tendency of the voice current to diminish in strength when sent over great distances. By 1911 the long-distance lines reached Denver.

After patient research on the part of scien-

Cuba and the United States were joined by telephone cable in 1921

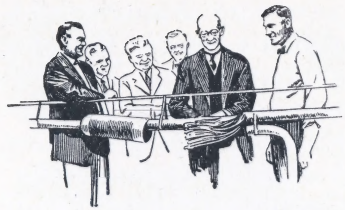
Upon the magic loom of esthe telephone, tens of millions of messages are daily woven into a marvelous fabric, representing the countless activities of a busy people

tists and engineers, devices were perfected which would restore the strength of the current and send it on its way with renewed vigor. In 1915 Boston talked with San Francisco over a telephone line 3650 miles long. In 1921 cable and wire and radio were linked into a circuit 5500 miles in length, connecting Havana, Cuba, with Catalina Island, off the California coast.

So I have added to the carrying power of my voice as I have grown up through childhood and youth to man's estate. But this problem of teaching me to add to the reach of my voice has not been the only one confronting Bell and his associates and those who have taken up the task they laid down.

Every child must learn to live his life, not as an individual, sufficient unto himself, but as a member of society. He must learn to live and to work with others. He must master the arts of cooperation and coordination.

A somewhat similar lesson was set before me in my schoolroom in the little Bell laboratory in Boston. The moment these schoolmasters of mine, the telephone pioneers, had conceived the idea of telephone *service*, it became obvious that the chief aim of the telephone could never be simply that of providing communication, for telephone service implied *inter*-communication. At first, the telephones were leased in pairs, to afford, for example, communication between a man's office and his home, and nothing else. Each pair of these instruments was a little system unto itself, performing its limited function satisfactorily enough, but not providing telephone service in any real sense, for there was



The last of 5,750,000 splices in the New York-Chicago telephone cable, 1925

no means of interconnecting these pairs of telephones so that conversation could be held from any one instrument to any one of the others.

How to provide this service of intercommunication was the next problem to be solved in the Bell laboratory; the next lesson which I, as a growing child, had to master. My training in this direction began simply, almost in primary-school fashion, for the first switchboard was a crude affair providing means of connecting only five telephones. These instruments had been installed in five Boston banks and this elementary central office did double duty as a telephone switchboard by day and a burglar alarm by night.

Crude though it was, this simple switching mechanism was sufficiently satisfactory to prove that a service of intercommunication could be given on a commercial basis, and a switchboard for this purpose was installed at New Haven, Conn., in 1878. This connected eight subscribers' lines.

So began the evolution of the switchboard, and my gradual growth from a mere idea into a great instrumentality which now provides universal service for millions of American telephone users. The very heart of this universal service is the switchboard, and the history of the development of this service has been written, to no small degree, in the development of the switchboard from these crude affairs to the great, multiple, common battery switchboards in use in the larger cities today, many of which serve 10,000 subscribers' lines.

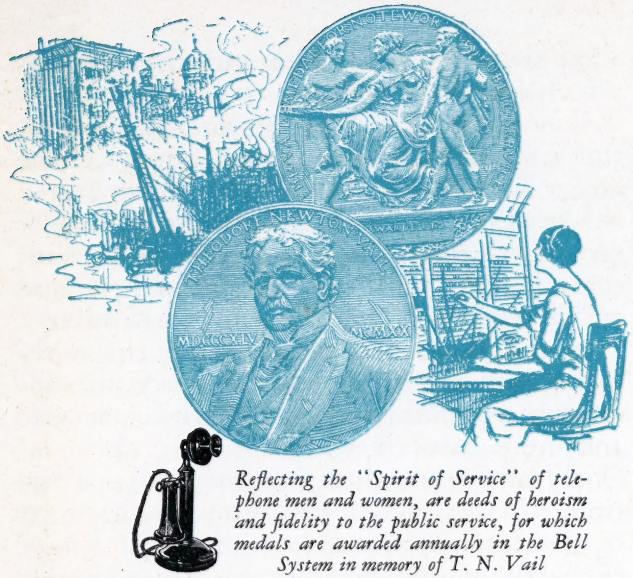
Cable manhole

As I began to grow—as telephone facilities were increased to meet the ever-increasing popular demand for telephone service—I was confronted with temporary difficulties that were not unlike "growing pains." The very fact that telephone facilities were increasing at such

a rapid rate in itself created new problems which had to be solved.

There was, for instance, the problem of the congestion of overhead wires in the larger cities, where heavy traffic necessitated the erection of pole lines carrying twenty or more crossarms. These towering poles with their weight of wires were unsightly and often dangerous, and it soon became apparent that means must be found to put the wires underground. The scientists in the Bell laboratory, which had meantime grown in size and in personnel, attacked this problem. Once more I returned to my lessons—this time to learn, as it were, how to become a mechanical mole, making my way through the earth, amid a maze of gas and water pipes.

Scientists in the laboratory patiently worked out the problem for me. Various forms of cable were tried, many of them with results that were far from satisfactory. Finally, a lead-covered cable, in which each wire was insulated from the others with a wrapping of paper, was tried and found far superior to all others. This is the type of cable used today throughout the Bell System, which has a total mileage of more than



Reflecting the "Spirit of Service" of telephone men and women, are deeds of heroism and fidelity to the public service, for which medals are awarded annually in the Bell System in memory of T. N. Vail

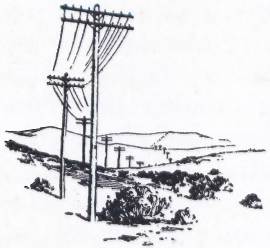
40,000,000 miles of wire in underground and aerial cable.

Great improvements have been made in cables since their first use in the early 80's, one of the most striking of which has been a gradual increase in the number of wires per cable. The first cables contained not more than fifty pairs of wires, while a modern cable of the same size—about the thickness of a man's wrist—contains as many as

1212 pairs of wires. This improvement has effected great economies, both in first cost and in maintenance, all of which have been of direct benefit to the American telephone user.

These are but a few of the problems solved by the engineers and scientists who have been responsible for the technical phases of my education—the men who, in the laboratory and in the field, have evolved the mechanism and the methods that make possible modern telephone service, as the American telephone subscriber knows it.

My technical education has included, indeed, the mastery of problems of which my earlier teachers never even dreamed. I have been taught, for example, to talk so loudly



Western deserts and mountains were crossed by transcontinental telephone wires in 1915

that with my assistance a public speaker may be heard perfectly by a crowd of a hundred thousand people. Carried over my nation-spanning wires, the voice of the President has thrilled two audiences simultaneously, on the two shores of the continent.

Open wire

I have learned how to send my word-bearing couriers through thousands of miles of space, without the use of wires. I have enabled men to converse across the Atlantic, bringing London within voice-reach of New York. I send to the ears of millions the words of the great orator, the stirring notes of a military band, the surging strains of a symphony orchestra or the tender cadences of a woman's voice as she sings a lullaby to tens of thousands of children. Subtract me, the telephone, from your radio set and the result is—*silence*.

But through all these years, while the scientist has been struggling with technical problems, other men have been solving problems of a very different sort, but problems

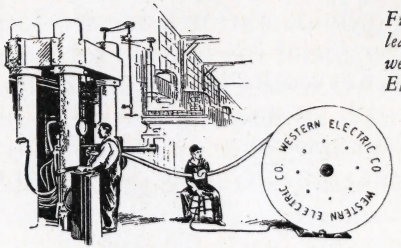
Photo-micrographic research in the Bell Telephone Laboratories

that have been in no sense less difficult. For in order to perform the task set before me—in order to provide the nation-wide service which was the ideal of the early telephone pioneers and has been the incentive and the goal of all who have followed them—I had to learn much more than the mere technical lessons given me to master. I had, as it were, to take a course in business.

I had to learn what kind of an organization could best provide nation-wide service; how to build a financial foundation for such an organization that would be firm and stable and still be capable of meeting the needs of growth and expansion; how to effect economies that would assure a service that would be within the financial reach of all who had need of it.

Here, too, my schoolmasters had to begin with elementary lessons. No widespread organization such as that which exists today was created in the early days of the telephone. In the business development of the invention, as in its technical development, those were the days of small beginnings, of lessons learned by the line and by the precept. But on the foundation then laid there has been built the organization which provides modern America with a telephone service that is the most widespread, the most efficient and the most economical in the world.

I had still other lessons to learn—lessons which may be called spiritual lessons. I had to learn to appreciate the peculiar responsibilities of providing a service which enters so intimately into the lives of those who use it. I had to come to believe that, since I could

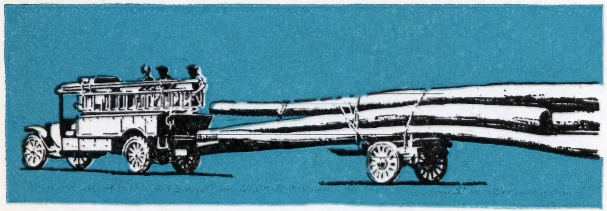


Fifteen thousand miles of lead-covered telephone cable were produced by the Western Electric Company in 1925

never know what telephone message might involve matters of life and death, all messages must be treated as if they were of vital importance. I had to affirm a service creed—a deep conviction that neither storm nor flood nor fire nor any other emergency must stay the words of men on their way over the wires; that no sacrifice is too great to make in order to assure dependable service at all times.

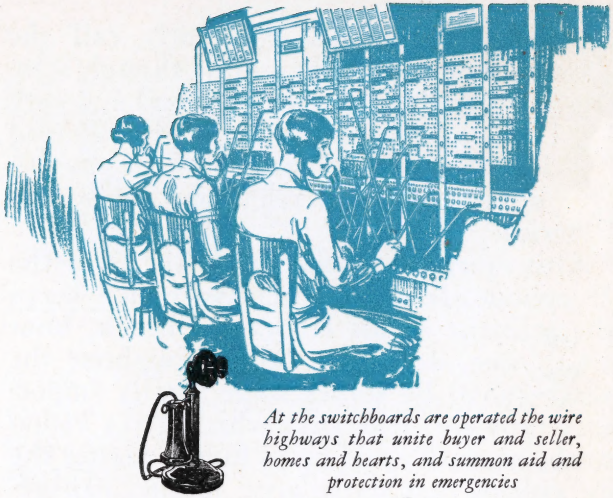
These lessons, too, I have learned. Gradually the telephone has been endowed with traditions. By a process of evolution, each step of which has been marked by acts of supreme devotion on the part of men and women in the telephone service, there has come into being what members of the Bell System family almost reverently call the "Spirit of Service." Intangible though it is, this devotion to duty is a very real and very vital force to telephone men and women, and provides the real explanation of the growth and development of telephone service in America.

This Spirit of Service, after all, is *I*—the Telephone. It is the incentive which keeps the scientist at his laboratory bench, hour after hour, day after day, throughout the years—until he solves some vitally important problem. It is that which gives vision to the executive and helps him to master the difficulties that daily arise in the management of an organization as vast as that which



The Bell System today employs 11,000 motor vehicles

nation-wide telephone service requires. It provides the unwavering courage which



At the switchboards are operated the wire highways that unite buyer and seller, homes and hearts, and summon aid and protection in emergencies

prompts a lineman to brave a winter blizzard in order that broken wires may be repaired, or which holds an operator at her post of duty when death by fire or flood stands grimly at her side. It is the thing that makes the telephone what it is to you—a devoted public servant, a guardian in times of danger, a faithful friend.

One other lesson I have had to learn throughout my fifty years of life—the lesson of ever looking forward to larger and larger opportunities of service. My half-century of existence has been a half-century of ever-widening horizons. I have grown with the nation and helped the nation to grow. My eyes have forever been on new goals to be attained, on new fields of usefulness. I have formed the habit of thinking in terms of growth in value to the public I serve.

And so, at the end of fifty years of service, I face the future, well assured that whatever may be the demands which the coming years may put upon me, I shall prove myself worthy of the confidence of a nation; worthy of the confidence which you, as an individual subscriber, daily declare when you call me *your* telephone.